source precursor solution, with a metal catalyst or an agent capable of producing said metal catalyst, said high-boiling point organic solvent having a temperature above 200° C., thereby forming a reaction product comprising semiconductor nanocrystals of various shape;

cooling the reaction product, and

subsequently exposing said cooled reaction product to at least one centrifugal step so as to obtain semiconductor nanocrystals having substantially rod-like shape.

2. A method according to claim **1**, wherein said metal source is a Group IIIa metal compound.

3. A method according to claim **1**, wherein said metal source is a Group IIb metal compound.

4. A method according to claim **1**, wherein said metal source is a Group Ib metal compound.

5. A method according to claim **2**, wherein said Group IIIa metal compound is a Group IIIa metal salt.

6. A method according to claim **5**, wherein said Group IIIa metal salt is a Group IIIa metal halide.

7. A method according to claim **6**, wherein said Group IIIa metal halide is $InCl_3$.

8. A method according to claim **1**, wherein said Group Va nonmetal source is in elemental form.

9. A method according to claim **1**, wherein said nonmetal source is a Group Va compound.

10. A method according to claim **9**, wherein said Group Va compound is a tris(trialkylsilyl) of a Group Va element.

11. A method according to claim **10**, wherein said Group Va compound is tris(trialkylsilyl)arsenine.

12. A method for the formation of Group III–V semiconductor nanocrystals having rod-like shape, comprising

(i) reacting, in a high-boiling point organic solvent, a precursor solution comprising at least one Group IIIa metal source and at least one Group Va nonmetal source with a metal catalyst or an agent capable of producing said metal catalyst, said high-boiling point organic solvent having a temperature above 200° C., thereby forming a reaction product comprising Group III–V nanocrystals of various shape;

(ii) cooling the reaction product, and

(iii) subsequently exposing said cooled reaction product to at least one centrifugal step so as to obtain Group III–V semiconductor nanocrystals having substantially rod-like shape.

13. A method according to claim **1**, wherein said nonmetal source is a Group VIa compound.

14. A method according to claim **1**, wherein said nonmetal source is a Group VIIa compound.

15. A method according to claim **1**, wherein said nonmetal source is a Group VIa element.

16. A method according to claim **1**, wherein said single-source precursor is selected from the group consisting of a compound comprising both Group Ib and Group VIIa elements, a compound comprising both Group IIb and Group VIa elements, a compound comprising both Group IIIa and Group Va elements, and a compound comprising a Group IVa element.

17. A method according to claim **1**, wherein said agent capable of producing said metal is a reducing agent.

18. A method according to claim **17**, wherein said reducing agent is selected from $NaBH_4$, KBH_4, and Na_2SO_3.

19. A method according to claim **1**, wherein said metal catalyst is selected from a noble metal, a group Ib metal, a Group IIb metal, a Group IIIb metal and a transition metal.

20. A method according to claim **19**, wherein said noble metal catalyst is gold.

21. A method according to claim **19**, wherein said Group IIIa metal is selected from Al, Ga, and In.

22. A method according to claim **19**, wherein said transition metal is selected from Fe, Zn, and Cd.

23. A method according to claim **1**, wherein said high boiling point solvent is a strongly coordinating organic solvent.

24. A method according to claim **23**, wherein said solvent is selected from trioctylphosphine (TOP), trioctylphosphine oxide (TOPO), triphenylphosphine (TPP), triphenylphosphine-oxide (TPPO), hexadecyl amine (HDA) and dodecylamine (DDA).

25. A method according to claim **12**, wherein step (i) is carried out under a pressure higher than normal pressure.

26. A method for the formation of InAs semiconductor nanocrystals having rod-like shape, comprising introducing a precursor solution of an In source and an As source into a hot mixture comprising $NaBH_4$ and a high boiling point organic solvent, said hot mixture having a temperature above 200° C., thereby forming a reaction product comprising InAs nanocrystals of various shape, and exposing said reaction product to at least one centrifugal step so as to obtain InAs semiconductor nanocrystals having a rod-like shape.

27. Group III–V semiconductor nanocrystals having rod-like shape, produced by the method of claim **1**.

28. Group III–V semiconductor nanocrystals having rod-like shape, produced by the method of claim **12**.

29. InAs semiconductor nanocrystals having rod-like shape, produced by the method of claim **1**.

30. InAs semiconductor nanocrystals having rod-like shape, produced by the method of claim **26**.

31. Inorganic semiconductor nanocrystals having a rod-like shape, produced by the method of claim **1**.

32. An optical device comprising a plurality of nanorods produced by the method of claim **1**.

33. The optical device according to claim **32**, operable as a wideband optical amplifier for amplifying data-carrying optical signals, the device comprising a pumping coherent-light source connected to a light transmitting medium for exciting each of said nanorods with light energy required for the amplification of data-carrying optical signals within a specific optical band received in said light transmitting medium, each of said nanorods having dimensions corresponding to said specific optical band and being located at a predetermined point within the light transmitting medium.

34. The device according to claim **32**, wherein each of said nanorods is luminescent in the near infra-red spectral range.

35. The device according to claim **32**, operable as a laser, comprising an active medium formed by the plurality of said nanorods uniformly dispersed in a laser host medium, a pumping source for exciting each of said nanorods, and an optical cavity providing an optical feedback mechanism for the coherent light produced by said laser active medium.

36. The device according to claim **32**, wherein said nanorods have identical orientation of their long axes, the device being operable as a source of polarized light.

37. An optical device comprising a plurality of InAs semiconductor nanocrystal nanorods produced by the method of claim **26**.

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